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Final Technical Report

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Mineralogy and Chemistry of Planets and Meteorites

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Brief Summary

The 15-year grant spanned the Apollo program for study of lunar samples, and this summary covers the data collection and the interpretation with respect to the mineralogy of meteoritic and terrestrial samples. Full technical reports were submitted each July of the grant, and the research program continues now under grant NAG 9-47. Briefly, the key conclusion is that the Moon underwent a series of melting episodes with complex crystal-liquid differentiation. It was not possible to determine whether the Moon melted completely or only partially. The origin of the Moon is still unresolved, but all simple models can be rejected. The stage is now set for a systematical geochemical and geophysical survey of the Moon. At the end of the grant period, emphasis was moved to meteorites in order to sort out their interrelationships from the viewpoint of mineral chemistry. Several parent bodies are needed for the achondrites with different chemical properties. Exploration of Mars is required to test ideas based on the possible assignment of shergottites, nakhlites and chassignite to this planet. Early rocks on the Earth have properties consistent with a heavy bombardment and strong volcanic activity prior to 4 billion years ago. The overall general conclusion is that the space program lead to a new scientific discipline, and that the early results on planetary mineralogy provide a firm basis for future exploration.

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